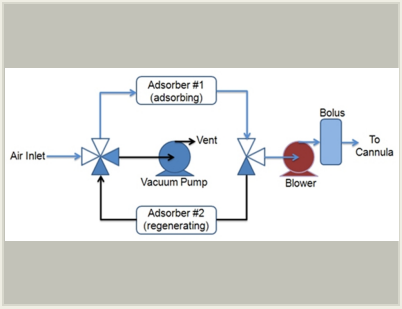
A Low-Power Medical Oxygen Generator, Phase I

Completed Technology Project (2014 - 2014)

Project Introduction

An on-board oxygen concentrator is required during long duration manned space missions to supply medical oxygen. The commercial medical oxygen generators based on pressure swing adsorption (PSA) are large and highly power intensive. TDA Research, Inc. (TDA) proposes to develop a small, lightweight, portable oxygen generator based on a vacuum swing adsorption (VSA) to produce concentrated medical oxygen. The unit uses ambient vehicle cabin air as the feed and delivers high purity oxygen while meeting NASA's requirements for high flow capacity, closed-loop tissue oxygen control and operation in microgravity/partial gravity. TDA's VSA system uses a modified version of the lithium exchanged low silica X zeolite (Li-LSX), a state-of-the-art air separation sorbent extensively used in commercial Portable Oxygen Concentrators (POCs) to enhance the N2 adsorption capacity. In Phase I, we will demonstrate the scientific, technical, and commercial feasibility of the oxygen concentrator module (OCM). The concentrator will have an adjustable pressure output to produce 2-15 lpm of O2 at 50 percent to more than 90 percent purity from ambient cabin air. The OCM will be capable of self-regulating the oxygenation of the patient using a closed loop feedback system that senses tissue oxygenation level. We will evaluate the sorbent performance in a breadboard bench-scale prototype under simulated microgravity/partial gravity exploration atmospheres and carry out a 10,000 cycle test (at a minimum) to determine its long-term performance and mechanical durability. Based on the experimental results, we will carry design the demonstration unit, optimize its power draw over the range of flows and oxygen levels, and determine its weight, volume and heat rejection requirements. This design will also include an inlet filter designed to remove potential smoke or toxic gases.



A Low-Power Medical Oxygen Generator Project Image

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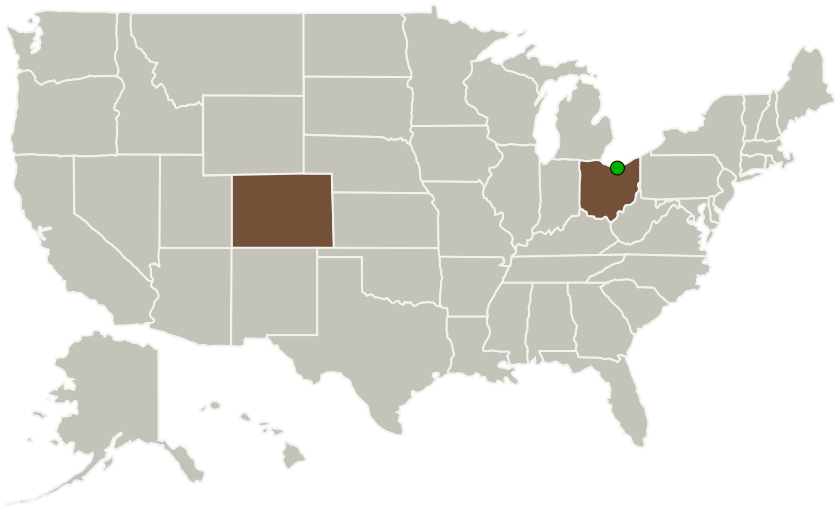
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
TDA Research, Inc.	Lead Organization	Industry	Wheat Ridge, Colorado
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Colorado	Ohio

Project Transitions

June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140525)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

TDA Research, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Gokhan Alptekin

Co-Investigator:

Gokhan O Alptekin

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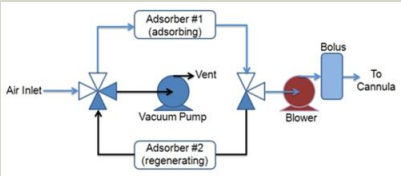
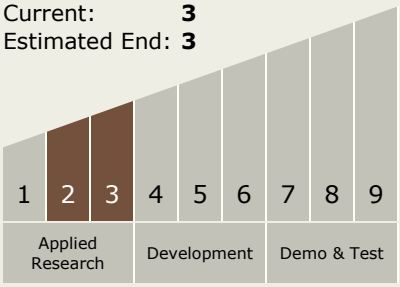
Images



Project Image
A Low-Power Medical Oxygen Generator Project Image
(https://techport.nasa.gov/image/134812)

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.3 Human Health and Performance
    - TX06.3.6 Long Duration Health

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System